evolutionary literature. The geological work of Darwin himself is passed over with the remark, "the only fossil animals he had personally studied were the Cirripedes." The post-Darwinian writers alluded to are Gaudry, Neumayr, Cope, and Zittel. This section will be of considerable interest to those who are beginning palæontology.

The second part of the work deals with the nature of variation both in recent time and throughout the ages. The phenomena chosen are those exhibited by certain helices, and the discussion is inadequate to the extent and importance of the subject. The author subsequently passes on to another group of Mollusca, the ammonites, in order to discuss the relationship between species in successive formations. Throughout this section and the following one, dealing chiefly with the evolution of certain Ungulata, the author is at pains to discriminate between the laborious work of Neumayr in tracing out the branches of one phylum from the parent stem, and the more brilliant but (according to him) less permanent work of Gaudry in piecing together the fragmentary records of several phyla or orders into a continuous history.

The two following sections give a short summary of the factors that accompany extinction, and of the events that constitute migration. Under the first of these the questions of size and complexity, of appendicular growths, and of senility are illustrated by examples, but are, of course, not answered. We miss any reference to the suggestive work done by Beecher on old-age problems in palæontology.

Between the discussion on extinction and that on migrations the author has intercalated a couple of chapters on the very kernel of his subject, *i.e.* the relation between individual and racial development and the nature of that variation which provides material for the development of new species. The treatment of these topics will probably be considered as very inadequate to their importance. In regard to mutations (for which the author has the phrase "explosions"), an extremely brief reference only is given to de Vries and Nillson, and none whatever to Mendel or to recent discoveries in genetics.

The work concludes by suggesting that earliest forms of fossils will be found at the poles, where "the earliest sediments may have escaped metamorphism by reason of their rapid incorporation into continents and the absence of a heavy superposition of later deposits." Let us hope that Lieutenant Shackleton will confirm this supposition.

As the quotation suggests, this book suffers from inadequate translation. Not only is the rendering obscure, but the author's use of terms such as polyphyletic, mutations, &c., to say nothing of stratigraphical terminology, is not that accepted in this country. Undoubtedly a general work of this kind is a need of the times, but we fail to see that this volume is an adequate rendering of the factors that accompany evolution. The book suffers from entire lack of references and illustrations, and in its English dress it contains many serious mistakes, *e.g.*, "chiroptera like the squirrel" (pp. 315, 351); "narrow cuttings" (evidently intended for "thin sections," p. 329); "eaters" (p. 315) is possibly intended for "rodents." To those who are familiar with the fossils and the authors referred to in the text, the volume may be not unacceptable as an attempt to deal in a continuous narrative with many and complex problems; but for the larger public that is anxious to obtain the latest verdict of science on the mode of origin of that splendid diversity that has accompanied animal evolution, the author assumes, we fear, too much detailed knowledge both of zoology and of geology.

## *TWO BOOKS ON THEORETICAL CHEMISTRY.*

(1) *Vorlesungen über chemische Atomistik.* By Dr. F. Willy Hinrichsen. Pp. viii+198. (Leipzig and Berlin: B. G. Teubner, 1908.) Price 7 marks.

(2) *First Principles of Chemical Theory.* By Dr. C. H. Mathewson. Pp. vii+123. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1908.) Price 4*s.* 6*d.* net.

(1) DR. HINRICHSEN explains that in composing these lectures he has expanded and completed two earlier works of his, (*a*) "Chemische Atomistik" (1906), and (*b*) "Über den gegenwärtigen Stand der Valenzlehre" (1902). The main topics are the usual ones of the atomic theory, the periodic system of the elements, valency, solution, and the relations between electricity and matter. Quite the best parts of the book are those dealing with the subject of valency, on which the author is an authority.

The lectures were delivered to audiences which did not consist entirely of chemists, and they begin and end with the relation between science and philosophy. In leading up to the atomic theory, the author makes a very suggestive quotation from Kant, of date 1786, to the effect that chemistry could not become a genuine science, and must remain a mere schedule of empirical knowledge, until the possibilities by number and measure of chemical action between different kinds of matter should be deduced from a theory. The author, instead of pointing out that Dalton did arrive at the law of multiple proportion by deduction from the atomic theory, adopts the erroneous view that the formation of the theory was a consequence of the discovery of the law.

J. B. Richter's work (1791–1802) is cited as a response—intentional or unintentional—to the stipulations of Kant. Actually Richter, with his hypothesis that the equivalent amounts of different acids fall into a geometric series, and of the different bases into an arithmetical, was much less fortunate than William Higgins, who explained the composition of different compounds of the same elements in terms of atoms. For instance, he supposed that sulphur dioxide consists of compound atoms, each made up of one atom of sulphur and one of oxygen, whilst the compound atom of the trioxide is made up of one of sulphur and two of oxygen. Higgins published his ideas in the year 1789.

The author states that he regards the historical development of chemistry as revealing the best order for studying and teaching the subject. Quite a number

of chemists now profess this belief without realising that the use of the historical method presupposes that the teacher has a grasp of history. Ostwald's dictum—"a most remarkable and praiseworthy thing in scientific literature is that almost every word is written conscientiously"—can hardly be applied to the usual treatment of the history of science. The historical conscience is somewhat blunt in the scientific man. In the present book, for instance, the statements are made that Lavoisier introduced the use of the balance into chemistry (p. 12), and that Dalton discovered the law of multiple proportion on consideration of marsh gas and olefiant gas, and then of carbon monoxide and dioxide, confirmed his discovery by the oxides of nitrogen, and then arrived at his atomic theory (p. 24). These statements are mere fiction.

In discussing solution, the author says nothing of the hydrate theory, and instead of pointing out that the theory of ions is extremely useful and extremely vulnerable, remarks that it can be regarded as one of the best-founded hypotheses of modern chemistry (p. 151). There is a curious statement on p. 40 to the effect that the practice of writing chemical formulæ, such as $H_2SO_4$, instead of $H^2SO^4$, is more common in Germany than elsewhere.

(2) This book is evidently the outcome of a keen interest in the teaching of chemistry. It is intended to be used by first-year students at a university, in connection with a course of lectures on chemical theory. There are chapters (in addition to what is to be expected on molecular and atomic weights, the periodic system, &c.) on the theory of electrolytic dissociation, the law of mass action, the phase rule, and thermochemistry.

Surely it is a mistake in policy to state Avogadro's hypothesis and to proceed without a moment's delay to apply the hypothesis to prove that the molecule of oxygen can be halved (pp. 11–12). Again, it would be much better to omit the proof on pp. 47–48—not a very clear one—that the "molecular weight of a gas is equal to twice its density compared to hydrogen." Once the student realises that under similar conditions the molecular weights of different gases occupy the same volume, it is obvious to him if it is only pointed out that he can find the density of a gas relative to hydrogen by dividing the molecular weight of the gas by 2 (the molecular weight of hydrogen).

A. N. M.

## OUR BOOK SHELF.

*Malleable Cast Iron.* By S. Jones Parsons. Pp. xi+171. (London: A. Constable and Co., Ltd., 1909.) Price 8*s*. net.

THAT malleable cast iron has been given a work to itself is an index of its growing importance in the world of iron and steel. The methods of its manufacture are so closely allied to the other parts of foundry work that it is doubtful whether it is not better dealt with in a general work on the foundry, where its special features may be pointed out in a section devoted to this subject.

The present work deals with the whole of the foundry aspects of malleable cast iron, melting, moulding, annealing, cleaning and straightening, design, patterns, inspection and testing, supplementary processes such as galvanising, and applications. The practical part of the work seems well done and needs little comment, but it is very unfortunate for those who are endeavouring to promote the application of science in the foundry that the compositions given on p. 9, if such pigs could be procured, would yield disastrous results. This is particularly unfortunate as the number of what are called "practical men" seeking the assistance of science in the foundry is steadily increasing, and these men are very keen on the quest after they have proved its first benefit. Anything misleading which would give them a feeling of distrust should be avoided if possible.

The analyses on p. 9 show pig-irons with from 0·145 to 2·52 per cent. sulphur and 0·93 to 1·50 per cent. phosphorus as suitable for the manufacture of malleable cast iron, whereas good specimens of this material do not contain more than about 0·1 per cent. phosphorus.

The definition of shrinkage is not good, and the author fails to grasp the essential differences between the manufacture of Réaumur and Blackheart malleable iron. Many other points have been noted, such as "that theorists regard the pyrometer as indispensable, but in practice it is less trustworthy than the trained eye," &c. W. H. Hatfield, whom he praises, would tell the author that this statement is quite out of date. This work as a whole is untrustworthy so far as the science underlying the manufacture of malleable cast iron is concerned. A. McW.

*A Manual of Infectious Diseases.* By Dr. E. W. Goodall and Dr. J. W. Washbourn, C.M.G. Second edition, revised and enlarged by Dr. E. W. Goodall. Pp xii+426. (London: H. K. Lewis, 1908.) Price 14*s*. net.

THE second edition of this well-known book has been prepared by Dr. Goodall, who expresses the loss sustained by pathology and clinical medicine by the untimely death of Dr. Washbourn, which occurred since the first edition appeared.

Little but praise can be expressed for the work. The descriptions of the diseases dealt with, their symptomatology and treatment, are clearly and concisely stated, and the differential diagnoses are excellent. All recent work seems to be incorporated, and the pathology and bacteriology of the diseases are given so far as is known. Thus, under small-pox, we find descriptions of the *Cytoryctes variolae* of Guarnieri and of the intracellular bodies of Councilman, Calkins, and Tyzzer.

We think that in a few instances the arrangement of the subject-matter might with advantage have been altered, or at least cross-references inserted. For instance, dealing with the "dissemination" of enteric fever, the part played by "bacilli carriers" is just noted, this portion of the subject being elaborated later under "Protection and Duration of Infectivity." Similarly the presence of virulent diphtheria bacilli in "well" persons as a mode of spread of the disease might have been emphasised, and membranous rhinitis should have been more clearly referred to in the section on "nasal diphtheria." The reviser believes that an attack of enteric fever confers almost complete protection; in this he is at variance with other recognised authorities. "Slop" diet is advocated for enteric fever, rightly so, we think; but some mention ought to have been made of more generous dieting as advocated by some, particularly in prolonged cases.

The authors doubtless had to set some limitation on the number of diseases dealt with, but as chapters are devoted to relapsing and typhus fevers and